



Prioritized Technology: Heat Shield Technologies for Planetary Entry and Sample Return – Aerocapture

Technical Goal

- Recent NASA studies indicate that aerocapture is presently feasible for Venus, Mars, and Titan using current technologies.
 - Aerocapture technology is sufficiently mature, but must be successfully demonstrated to mitigate the perceived risks associated with mission implementation.***
- The readiness of aerocapture for Uranus and Neptune missions must still be evaluated to assess the need for developing new GN&C algorithms and/or new hardware.

Mission Applications

- Aerocapture results in significant mass savings as compared to propulsive orbit insertion methods.
- Aerocapture offers many advantages over aerobraking and may be essential for future SMD exploration missions.
 - The desired science orbit is achieved immediately upon arrival, reducing the risks associated with multi-pass aerobraking.
 - Reduced operational costs associated with multi-month aerobraking.
 - Eliminates complexities associated with long-distance operations.
- The use of aerocapture reduces the propellant requirements and results in overall system mass savings.

Technical Status

- Given the lack of flight heritage, a cost-effective demonstration of aerocapture will accelerate adoption to the critical path for planetary missions:
 - Low-cost demonstration options have been identified, but the concepts must be analytically refined, matured, and ultimately implemented (Ideal training opportunity to properly mentor and educate new engineers).
 - Small satellites and SLS secondary rides may be leveraged to perform affordable demonstrations.
 - In addition to demonstrating feasibility, critical data will be obtained and applied to future system designs.
- The New Millennium ST-9 proposal (2007) was to demonstrate aerocapture at Earth and was also relevant to Mars, Titan, and Venus (\$150M).

Development Cost and Schedule